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Students' Experiences of Emotional Connection with Pedagogical Agents

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INTRODUCTION

Daily activities in the UK – such as socializing, shopping, or learning – are increasingly mediated through cyberspace environments. The exact nature of these environments can include predominantly textual 2D websites, such as forums or commercial websites, or 3D graphical environments, such as virtual worlds. Whilst these environments vary considerably in nature, certain similarities can be identified. One such pattern is the increasing presence of the chatbot in commercial, industrial, and educational settings. Chatbots are characters on a computer screen with embodied lifelike behaviours such as speech, emotions, locomotion, gestures, and movements of the head, the eye, or other parts of the body (Dehn & Van Mulken, 2000). They are typically used to provide advice on a 24/7 basis, enabling users to ask a 'human face' for support without requiring a human advisor to be present at all times.

In recent years, the use of chatbots has become increasingly common in educational settings; as educational tools, they are known as pedagogical agents (Veletsianos & Russell, 2014). The current difficulty is that whilst research into the use of pedagogical agents has increased in recent years, it is somewhat inchoate and has failed to distinguish practices across different disciplines. Furthermore, the research that *has* been undertaken has not yet drawn distinctions between practices in difficult and sensitive settings which are particularly important for vocational courses such as healthcare or counselling (for example, Heidig & Clarebout, 2011). Thus there is little understanding of how students might engage with pedagogical agents when discussing sensitive topics, and how this might impact upon truthfulness and trust, which are particularly complex concepts in a networked society.

This article begins by discussing issues of truthfulness and trust with regard to teaching and learning. It goes on to identify current issues surrounding the use of pedagogical agents, drawing upon research from both educational and commercial settings. Findings are then presented from two research studies that used responsive evaluation to explore students' experiences of engaging with pedagogical agents on sensitive topics. The findings from these studies identified truthfulness, personalisation and emotional engagement as vital components in interacting with pedagogical agents. It concludes by offering recommendations for practice and identifying priority areas which require attention in future research and development.

BACKGROUND

The continuing debates about the nature and process of learning in higher education have created a minefield of overlapping concepts, with few clear frameworks for understanding the relationship between the context and the experience of the learner. However, those in the field of critical awareness have argued that theirs

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is not simply another perspective on adult learning but rather a shift in ideology. The ideals of this tradition stem largely from theorists such as Freire (1972, 1974) and hooks (1994), who have argued that social and historical forces shape the processes through which people come to know themselves and develop their view of the world. Learning is therefore seen to occur in a social and cultural context and this necessarily influences what and how people learn. Learners therefore must seek to transcend the constraints their world places upon them in order to liberate themselves and become critically aware. Yet it would seem that higher education has increasingly become colonised by an enterprise culture and the result is that students and academics have become defined by and through this culture. These colonising forms of enterprise higher education reflect the market forces and the quick fix stance of commerce and industry. Higher education that only supplies 'training' is unlikely to equip students to work in an uncertain world. Giroux and Giroux (2004) have argued that educators should build courses by combining 'democratic principles, values, and practices with... the histories and struggles of those often marginalized because of race, class, gender, disability, or age' (p. 99). They argue that academics should shift beyond the lands of academia and integrate with the larger spheres in the community, where culture and politics are truly learned and made relevant. One such sphere is the online world, a core part of students' everyday lives.

Yet in doing so we are faced with issues around honesty, plagiarism and self disclosure, concepts which seem evermore challenging in the seeming anonymity of online environments. The notion of whether truth exists and whether it can be ascertained is one that has been discussed and debated *ad nauseum*. Notions of 'Truth,' 'truth,' 'truths,' 'truthfulness,' and even 'truthiness' have been considered for their applicability in education and social science (Major & Savin-Baden, 2010). While these concepts clearly are value laden and may be picked apart for accuracy, precision, desirability and achievability, it is still clear that the teachers and researchers should make some effort to present some version of multiple realities. Yet truth telling, disclosure and online behaviours remains a contested area in higher education. Some staff over regulate and over moderate behaviours, others do not. For example, approaches to teaching in virtual worlds often seem to differ not only because of the medium being used but also because of the nature of immersion and presence that occurs in that environment. This is because 'being' in a virtual world prompts us and our students to engage with issues of embodiment and questions about positioning and power. Some questions that relate to these issues might include:

- How does the lack of face-to-face engagement influence students' willingness to trust teachers and other students when disclosing information?
- What is appropriate and acceptable behavior in a virtual world, i.e. students coming to class as an animal or naked, or changing clothes whilst the teacher is speaking?

These questions, and the ethics of being in virtual worlds, are beginning to be considered (e.g. Turkle, 2010), contributing to a critical and informed debate about learning and discussion in virtual worlds. However, notions of truthfulness, trust and responsibility with regard to pedagogical agents have rarely been addressed (Culley & Madhavan, 2013). The following section explores the key issues of truthfulness, trust and realism in pedagogical agent-student interaction.

Trustworthiness and Truthfulness

Trust is defined here as 'an attitude of confident expectation that one's vulnerabilities will not be exploited' (Corritore, Kracher, & Wiedenbeck, 2003, p. 70). It has been established that the disclosure of information requires the formation of a trust relationship (Wheeless & Grotz, 1977), and that online environments can be the objects of trust (Corritore et al., 2003). For some, the fear and anxiety associated with making oneself vulnerable online is specifically associated with 'transactions characterized as faceless and intangible' (Beldad, de Jong, & Steehouder, 2010, p. 857); chatbots are neither faceless nor intangible, and thus pose different, but no less challenging, issues.

It has been suggested that students can become comfortable interacting with high-quality pedagogical agents, and that emotional connections may develop (Culley & Madhavan, 2013). Hasler, Touchman and Friedman (2013) also found, in a comparison of human interviewees with virtual world agents, that chatbots and human interviewees were equally successful in collect-

ing information about their participants' backgrounds. Further, Lessler and O'Reilly (1997), who found that self-administered surveys could yield more truthful responses than interview methods, particularly in sensitive disclosure situations. This emotional connection has been found to be one of the strongest determinants of a user's experience, triggering unconscious responses to a system, environment or interface (Éthier, Hadaya, Talbot, & Cadieux, 2008). These feelings strongly influence perceptions, enjoyment, and pleasure, ability to trust and disclose information, and influence how we regard our experiences at a later date. Emotional design at the basic level involves minimising common emotions related to poor usability such as boredom, frustration, annoyance, anger and confusion. Dennerlein, Becker, Johnson, Reynolds and Picard (2003) stated that during a computer task, systems usability may play a role in creating stressful situations that manifest themselves into various exposures to biomechanical stressors. Thus emotional design also should also focus on invoking positive emotions associated with acceptance of the system and continued usage, such as credibility and trust. Yet there is little understanding of what informs these experiences, although the realism and appearance of the pedagogical agent appears to be a key feature.

Pedagogical Agent Realism

The appearance and realism of pedagogical agents has been identified as important in determining users' willingness to trust and disclose information. For example, the perceived trustworthiness of agents has been shown to increase with degrees of anthromorphism (Gong, 2008), as has the believability of the agent (Demeure, Niewiadomski, & Pelachaud, 2011). Consequently, researchers have turned their attention to the realism of agents in educational settings. Kim and Wei (2011) found that students tended to choose same gender and same ethnicity agents when provided with the opportunity, but that this had no impact upon their learning experience and retention.

What has been identified as more important, however, is the matching of audible realism with pedagogical agent realism. Studies exploring the influence of voice found that computer-synthesized voices were perceived less favourably than human voices, with the emphasis placed on words, and pauses between words, improving student learning in a pedagogical agent situation (Clark & Mayer, 2008). Furthermore, split-attention effect (Garau et al., 2003), in which students experience a higher cognitive load due to competing demands for their attention, occurred when students felt an agent's voice and appearance did not match and were therefore distracted from the learning activity at hand. The impact of split-attention affect is significant; it reduces the believability and, consequently, willingness to trust the agent (Demeure et al., 2011). Attention has also been paid to appearance and self-awareness (Ijaz, Bogdanovych, & Simoff, 2011). More recently, attention has shifted from exploring the impact of realistic *appearance* to realistic *interactions*. Morrisey and Kirakowski (2013) identified 7 themes influencing users' perceptions of realistic interactions: maintenance of themed discussions; responding to specific questions; responding to social cues; using appropriate linguistic register; greetings and personality; giving conversational cues; and inappropriate utterances and damage control. These themes suggest a much more discerning userbase and makes significant demands of chatbot developers. Chatbots, in order to be considered realistic, needed not only to *look* realistic but to *interact* with realistic (i.e. human) mannerisms.

The literature discussed above found that understanding of pedagogical agent application, whilst increasing, is inchoate. The realism and voice of the agent was seen to help shape emotional connection, which was further informed by concepts of co-presence and immersion. Yet this emotional connection and thus the potential learning application of these technologies, was determined partially by levels of trust and risk, as Corritore et al. (2003) noted. Such findings suggest that the context within which the student and pedagogical agent are interacting, whether in an interviewing context or in discussion of sensitive topics, for example a counselling module, are critical. This article now goes on to present the findings of a study focused on these issues in particular.

STUDENT DISCLOSURE TO PEDAGOGICAL AGENTS ON SENSITIVE TOPICS

The following section reports on the findings from two studies exploring the use of pedagogical agents to deliver a survey and provide information on stu-

dent lifestyle topics: financial management, alcohol, plagiarism, drugs, and sexual health. These projects were funded as part of a study into the potential influence of pedagogical agents by a large funding body. Development work was undertaken by Daden Ltd, and evaluation completed by Coventry University. Ethical clearance was gained from both the funding body and Coventry University.

Methodology

The studies were underpinned by a responsive evaluation methodology, which is a pragmatic approach designed to accommodate specific situations, contexts and questions. Responsive evaluation is reliant on natural communication and responsive to the stakeholder requirement for facts and knowledge (Stake, 1983).

These two studies were developed in response to three specific needs:

1. A lack of understanding of student responses to pedagogical agents, particularly on sensitive topics;
2. An ongoing need to provide students with essential information pertaining to the student lifestyle issues listed above
3. The need to improve survey response rates and reliability of results, particularly in relation to sensitive topics (Barak & Gluck-Ofri, 2007)

These evaluations therefore explored the extent to which pedagogical agents may affect a student's reactions and responses, paying particular attention to the sensitivity of the topic under discussion. They sought to answer the following question – what factors are important in the emotional connection between students and pedagogical agents?

Study Procedures

The studies followed the following phases:

- The creation of a website with information on sensitive issues (finances, plagiarism, alcohol, drugs and sexual health) to put the agent into context. The website hosted 5 different types of pedagogical agents of different genders, races, and levels of authoritativeness, represented through dress and facial expression.

Study 1: The testing of the agents with 12 students (m=4; f=8, both postgraduate and undergraduate).

- Technical improvement, addition of 5 extra agents, and alteration to include 3 types of agent interaction:
  - **Short-term chatbot:** Students engaged with the agent for one 25 minute session only
  - **Long-term chatbot:** Students engaged with the agent for 5 different visits over a period of 2 weeks. Each visit lasted 5 minutes.
  - **Long-term chatbot with additional engagement:** As with type 2, except that students were asked additional questions for each session unrelated to the sensitive topics, such as favourite TV shows or sports.

Study 2: Ongoing testing of the agent with 150 (m=33; f=117) students, both undergraduate and postgraduate.

Data were collected through the following methods:

1. **Study 1 and Study 2:** An online questionnaire with an interactive pedagogical agent, in which students were asked questions on sensitive issues relating to healthcare and lifestyle issues. Data here were taken from amount of words disclosed to the agent and, in the case of the second study, a comparative questionnaire with no agent.
2. **Study 1 only:** A semi-structured face-to-face interview on the topic of the student's experience of using the interactive pedagogical agent (average 30 mins). The interviews were audio recorded and transcribed for data analysis purposes

Combined Study Findings

The following section discusses students' willingness to disclose information to the pedagogical agent, and the factors which seemed to influence this disclosure. It reports on the findings of the first study, and presents early trends identified in the second study. Participants' perceptions of pedagogical agents focused on the no-

tion of *realism*. The degree of perceived realism was influential in two of the three themes identified: student *truthfulness* when engaging with the agent, and the *emotional engagement* observed between student and agent. The final theme (*personalisation*) focused on student responses to the personal attributes of the agent, e.g. appearance, and gender. Illustrative examples are presented below.

Truthfulness

Student willingness to disclose information to and be truthful to the pedagogical agent was influenced by notions of support and of judgement, which in turn seemed to be influenced by the relative realism) of the agent. For some students, the anthromorphic appearance of the agent facilitated a sense of engaging in conversation with another person and thus disclosing information to them. For others, however, the understanding that the agent was not a person implied a lack of judgement, which also facilitated increased disclosure to the agent. For example, Rose commented:

If you do it with a real person then you might feel a bit scared and awkward. So it's more personal but not so personal that you feel a bit awkward. I think if you were talking to a person and they were asking those questions and you wouldn't want to, you wouldn't want to tell the truth.

For Rose, the agent was considered in relation to two possible alternative options: a face-to-face interview, which was too personal and thus awkward, or a survey lacking the 'personal' connection she felt necessary to disclose information. Rose's truthfulness to the agent in this study was thus established as situational; she felt willing to disclose more information to the agent over a person *because* of the sensitive nature of the survey. Consequently, the agent's realism was influential in establishing a safe space in which she felt comfortable in disclosing information. For Rachel, this safe space was closely related to notions of judgement:

It didn't matter what you said to it, I found that you could be truthful with it because there was no-one you were talking to who could judge you.

Like Rose's fear that the discussion of sensitive topics might lead to awkward situations, Rachel envisaged receiving judgement from an interviewer upon disclosure of information about the topics. As opposed to the agent inhabiting an in-between space – as it did for Rose – Rachel saw speaking to the agent as akin to speaking into an ether, disclosing sensitive information without fear of reprisal, shame, or consequence. Yet whilst Rachel suggested that "it didn't matter" what she said to the agent, suggesting that disclosing untruthful information might be equally easy, for others, it was important to provide truthful information to the agent.

Emotional Engagement

This section goes on to explore the degrees of emotional engagement participants experienced with the pedagogical agent. Whilst many students felt a sense of being in a panoptical space (the feeling of someone 'listening' or 'being there'), for others, the degree of realism in the agent obstructed this. For example, Tom's quote suggests an entirely different experience to Alice's:

I didn't think it was like talking to a person at all really, I found the [pedagogical agents] very robotic, I mean they sort of moved in a very robotic, plastic fashion and occasionally blinked or something, it wasn't very high fidelity.

Tom's perception of the pedagogical agent's body language and facial expression challenged his ability to emotionally engage in the interaction, distinguishing the agent as a robot as opposed to a 'person'. Such a reaction might perhaps be attributed to prior experience with more technically sophisticated chatbots or gaming environments, based upon Tom's comment that it "wasn't very high fidelity." For others (such as Sally), however, the relative fidelity of the agent played little part in their emotional engagement:

It felt, I don't know, maybe the fact that someone was there in a sense, you felt a bit more, oh okay, someone's listening, than when it's a questionnaire it's like oh no-one will really read this.

Instead, the physical presence of the agent – realistic or not – invoked a sense of co-presence, of being in a space with the pedagogical agent. From this belief that someone was present, Sally also assumed that they were listening and caring about her responses. The presence of the agent facilitated a shift in perception of the survey, those reading it, and the value accorded to her words.

For Claire, however, the presence of the agent did not necessarily result in a belief that her words were being heard and valued:

And it felt a little impersonal at times because you know you move from one topic to another topic, very separate topics, and it was almost like, you don't care what I'm telling you, do you?

Whilst the agent was seen to be 'listening' here, its responses did not conform to the expected conversational norms such as responding to her answers or forming linking statements. The agent's inability to formulate responses based upon Claire's dialogue was interpreted as not caring about what she had to say. Consequently, the agent was perceived as failing to contribute to the emotional engagement Claire saw to be necessary in the interaction.

The theme of emotional engagement emphasised that in situations where the student seemed to experience immersion and co-presence in the engagement, the ability of the pedagogical agent to interact could both improve and detract from their emotional engagement in the interaction. This sense of emotional engagement could be improved through personalisation, which is explored in the following theme.

Personalisation

The theme of personalisation addressed the ways in which students' preferences were accommodated by the provision of a variety of pedagogical agents. Student responses were highly individualized, yet certain key trends emerged: agents needed to be relatable, unthreatening, and non-judgemental. The agents fitting those characteristics differed according to each student. For one student (Colin), the agent's professionalism was key to his willingness to engage:

I find it easier talking to women, so I looked through the women, and the person, she looked like a newsreader, a correspondent.

Colin's decision about which pedagogical agent to choose was based upon the presumption that the physical appearance of the agent would influence the information he shared, or at least his willingness to share. The agent's professional appearance, conveyed by her age, a smart suit and hair in a bun, invoked a sense of professionalism, authority and potentially, trustworthiness. Colin's choice of agent might perhaps be designed to assure him that the agent would not engage in unprofessional behaviour such as sharing his survey. For others such as Sally, however, it was important that the agent be of the same age as them:

I was sort of looking through and he... looked my age. So it wasn't as threatening. I don't know, I felt that it would be like a one-to-one chat instead of an interview with someone older.

In contrast to Colin, who sought out a professional interview situation, Sally found such discussions threatening. Instead, she made a clear decision about the kind of interaction she would prefer in this particular context; a one-on-one chat with a friend about sensitive topics. The notion of friendliness and approachability was particularly important for several students in this study, with Claire commenting:

I liked the look of the person I chose, and it did make it more personal, being asked questions by that pedagogical agent. She looked kind, friendly. And young, beautiful. And yeah, approachable.

Like Sally, Claire sought out a type of pedagogical agent who she might normally discuss sensitive topics with on a casual basis: kind, friendly, young, approachable. Such findings suggest that the physical appearance of the agent, in all three cases, was far less important than the impressions they invoked for users.

The previous themes have revealed that the sensitive nature of the topics under discussion was particularly

important in Study 1, influencing student willingness to be truthful to the pedagogical agent, and especially the personalisation of the agent. Trends in Study 2 support these findings, suggesting that individuals were more likely to talk about sensitive topics such as drugs or sex with a pedagogical agent compared to the standard questionnaire (questions presented onscreen without an agent). In comparison, individuals showed a tendency to talk less about less sensitive topics such as money, alcohol and plagiarism, when talking with an agent. Trends also suggest that males were more likely to disclose more information to the pedagogical agent; however this must be considered in relation to a high female bias in the sample. The following section reviews the findings presented and makes suggestions and recommendations based upon these.

Solutions and Recommendations

The preceding findings suggest that 3 key issues are important in the emotional connection between pedagogical agents and students: firstly, emotional engagement with the agent, secondly, the context, and thirdly, truthfulness. The appearance of the selected pedagogical agent and the impressions it invoked, were found to play a role in students' willingness to disclose truthful information. The relationship between these issues is now addressed.

Engagement with the pedagogical agent appearance was discussed in terms of the realism of appearance, yet students responded differently to perceived levels of realism. For some students, split-attention effect occurred (Garau et al., 2003), in which the student struggled to focus on interaction due to the lack of realism of the agent. Whereas for other students, physical appearance was important for effective engagement. These physical appearances seemed to evoke particular emotional responses, such as friendliness, professionalism and a non-threatening approach, which were deemed to be particularly important. These findings are supported by other work in the area, most notably feelings of immersion and the sense of co-presence (Kim & Baylor, 2006). It would seem that choice is essential when seeking to facilitate increased disclosure to a pedagogical agent, particularly in regard to sensitive topics.

The context in which the pedagogical agent was placed was also important to students' ability to relate to the agent. The findings presented from Study 1 illustrated that the sensitivity of the topics was influential in levels of disclosure, enabling students to relate to the agent by providing stories of their experiences at university. Early findings from Study 2 also suggest that students consider levels of sensitivity when disclosing information, and this requires further consideration. Consequently, the roles pedagogical agents were expected to fulfil were dependent upon the context, discipline and indeed to individual modules. Such findings support findings of prior studies which suggest that adaptivity of the system and emotional connection with agents are intrinsic to the user's belief that they are involved.

Truthfulness and truth telling thus remains complex issues to manage in a networked society, yet it was important to note that the users suggested that they felt more comfortable disclosing sensitive information to pedagogical agents than to the interviewer. The amount of truthful information divulged was dependent on how well the participant engaged with the pedagogical agent; for example, Claire wanted to divulge more information but felt rushed by the pedagogical agent body language and movements. Tourangeau and Smith (1996) suggested that the reasons participants provide different answers to the same questions under different data collection methodologies are a function of three issues –

- The degree of perceived privacy;
- The legitimacy it confers;
- The cognitive burden it imposes on the respondents.

Consequently, it is possible that the pedagogical agent format may be perceived as of greater privacy as interviewers need not be present, as suggested by Rose and Rachel; the software platform associated with the agent interface can be designed to provide participants with a strong sense of legitimacy for the survey being conducted, and the flexibility of using auditory and/or text based administration may reduce the cognitive load associated with more traditional survey methods (Tourangeau, 2004). Such findings support those of Barak and Gluck-Ofri (2007), who suggest that the social environment of cyberspace is characterised by more open, straightforward and candid interpersonal communication, and that a pedagogical

agent can support this. There have been various studies that provide arguments to support these patterns of communication, for example disinhibition effects (Joinson, 1998) deindividuation (Postmes, Spears, & Lea, 2000), and the emergence of 'true self' (Bargh, McKenna, & Fitzsimons, 2002). Pedagogical agents would thus seem to offer an opportunity to engage differently with education in an uncertain world (Barnett, 2007). These findings thus introduce questions about the role of staff and students in such spaces and issues relating to levels of engagement, real world behaviors. Yet at the same time the exploration of emotion, truth telling, disclosure embodiment and presence in online learning, seem for many staff something of a departure for higher education. We suggest, however, that in a critical approach to learning, the examination of these experiences is essential.

FUTURE RESEARCH DIRECTIONS

Based upon the findings of these two studies, we identify five key issues for future studies in this area:

1. Capitalising on an understanding of user emotions makes it possible to enhance the level of individual connection with the learning environment and the sense of immersion
2. An emotional design philosophy will ensure emotional connection with the pedagogical agents
3. Learning using pedagogical agents offers opportunities for displaying, testing and responding to the emotions of self and others in a safe and non-threatening environment.
4. Focusing on adapativity and emotional design seems to heighten the sense of immersion, and therefore it is argued, the disclosure potential.
5. The adaptivity of the system and emotional connection to the pedagogical agent are intrinsic to the student's belief that they can trust and therefore be more truthful.

CONCLUSION

The use of pedagogical agents has the potential to disrupt the ways in which we learn in online settings; it is from this platform that we suggest there is a greater need to understand the ways in which individuals relate and disclose information to agents. As pedagogical agent technologies are increasingly integrated into commercial and educational arenas, it seems likely that they will transfer to mobile as well as blended learning settings. It is suggested, therefore, that such applications require both pedagogical nuance and further research into the ways in student perceptions of pedagogical agents are informed by the context within which they interact. These two studies suggest that further research is required into the impact of student engagement with pedagogical agents, the extent to which context really does have both an immediate and long term effect. However issues of trust and truth telling would seem to be particularly important areas for future research given the ebbs and flows of truthfulness in the current age. On a more practical note the research team will seek to build on this project by investigating further the ways in which how emotional cues from the learner can be used to adapt the learning environment and learning contexts to improve in performance.

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KEY TERMS AND DEFINITIONS

Anthropomorphism: The attribution of human features to an object (chatbot).

Chatbot: Characters on a computer screen with embodied life-like behaviours.

Co-Presence: The sense of being present and connected with others in a virtual environment.

Emotional Engagement: A user's belief that a personal connection (either positive or negative) exists between themselves and the chatbot. Informed by the related concepts of *immersion* and *social presence*.

Immersion: The sense of the user feeling 'in' or 'part' of a virtual environment and they become absorbed and deeply involved as they interact with it.

Pedagogical Agent: A chatbot used for educational purposes.

Personalisation: The ability to choose or adapt a chatbot according to personal preferences.

Trust: An attitude of confident expectation that one's vulnerabilities will not be exploited.

Truthfulness: The provision of accurate information.